Fallow deer (*Dama dama*).....May 3
Sambar (*Rusa unicolor*).....June 18
Hog-deer (*Hyelaphus porcinus*).....July 8

It would be interesting to have dates from other zoological gardens, both in America and Europe, for comparison.

—*N. Hollister.*

RECENT LITERATURE

Hall, Harvey Monroe, and Joseph Grinnell. LIFE-ZONE INDICATORS IN CALIFORNIA. Proc. California Acad. Sci., ser. 4, vol. 9, no. 2, pp. 37–67. June 16, 1919.

Few devices for handling the data of geographic distribution of animals or plants have been more useful than the life-zone. For satisfactory zonal diagnosis of a given locality it has usually been necessary to make an exhaustive study of the entire fauna and flora. To obviate this necessity, so far as California is concerned, is the hope of the authors of this paper, who proceed to list certain critical species of plants, amphibians, reptiles, birds, and mammals as life-zone indicators.

Almost at the outset the importance of recognizing local modifying factors is emphasized. Those considered are slope exposure, air currents, streams carrying cold water, evaporation from moist soil, proximity to large bodies of water, influence of lingering snow banks and of glaciers, changes in vegetal covering, extent of a mountain area, rock surfaces, miscellaneous local influences.

Five criteria are given as among those used in the selection of the life-zone indicators. Briefly stated these are (1) Only breeding records have been taken into account. (2) In plants perennials are usually preferred to annuals. (3) The more abundant a species the greater its value as an indicator. (4) A particular indicator, though constant in zonal position in one portion of its range may be unreliable when its entire range is considered, due "perhaps to the possible development of hardy strains in one portion of the range and not in another," or to some other cause. Furthermore, biotypes, similar in external characters but reacting differently to their environment, may escape detection by the taxonomist. (5) So far as possible, indicators listed by C. Hart Merriam are used, since the authors in the main accept his delimitation of the life-zones.

The lists of mammalian indicators include: For the Lower Sonoran, 78 forms belonging to 34 genera; Upper Sonoran, 48 forms, 18 genera; Transition, 27 forms, 14 genera; Canadian, 30 forms, 15 genera; Hudsonian, 7 forms, 5 genera. No mammals, reptiles or amphibians are listed for the Alpine Arctic, the sole indicator aside from plants being the rosy finch, *Leucosticte tephrocotis dawsoni*. It so happens that among the animals listed there are more mammalian indicators than bird, reptile, or amphibian for each zone except the Transition (which has three more bird indicators than mammalian) and the Alpine Arctic.

The paper will be of interest to every student of the distribution of the higher vertebrates of the western states.

—*Walter P. Taylor.*